CLAIMS

1. A percussion drill bit for drilling into a subterranean earth formation, the drill bit having a central longitudinal axis and being operable by applying repetitive axial percussive impacts on the drill bit in a direction having a component along the axis and by applying rotary motion about the axis relative to the earth formation, the drill bit comprising:

- one or more axial cutters for predominantly axially cutting the subterranean earth formation in response to the axial percussive impacts;
- one or more shear cutters for predominantly shear cutting the subterranean earth formation in response to the rotary motion; whereby

there is a first shear cutter of the one or more shear cutters, and whereby one or more of the axial cutters are arranged with respect to at least the first shear cutter to engage with the subterranean earth formation earlier during a percussive impact than at least the first shear cutter.

2. The percussion drill bit of claim 1, wherein the one or more axial cutters are arranged with respect to the first shear cutter to penetrate on average deeper into the earth formation than the first shear cutter in each percussive movement, preferably at least 1.5 times deeper, more preferably at least 2 times deeper.

3. The percussion drill bit of claim 1 or 2, wherein the first shear cutter is arranged in a first annular track about the central axis, the first annular track having a radial width corresponding to the radial width of the first shear cutter, whereby the one or more axial cutters are arranged in the first annular track.

4. The percussion drill bit of any one of the previous claims, wherein the one or more axial cutters and the first shear cutter each have an impact point, defined as the part of the cutter that serves to firstly engage with the earth formation on an axial percussive impact, whereby at least the impact point of the first shear cutter is recessed by an amount of r in respect of the impact points of the one or more axial cutters.

5. The percussion drill bit of claim 3 and 4, wherein there is a second shear cutter arranged in a second annular track about the central axis, the second annular track having a radial width corresponding to the radial width of the second shear cutter, whereby one or more axial cutters are arranged in the second annular track, whereby the impact point of the second shear cutter is recessed in respect of the impact points of the one or more axial cutters in the second annular track by an amount larger than r.

6. The percussion drill bit of claim 5, whereby the second annular track is radially further outward with respect to the central axis than the first annular track.

7. The percussion drill bit of claim 4, 5, or 6, wherein $r > 0.25$ mm, and preferably $r \geq 0.50$ mm.

8. The percussion drill bit of any one of the previous claims, wherein the axial cutters have dome shaped or essentially hemispherical shaped cutting surfaces.

9. The percussion drill bit of any one of the previous claims, wherein the shear cutters have a rake surface facing the flow channel associated with it at a back-rake angle of less than 90° wherein the back-rake angle is defined as the angle between the projection of a line perpendicular to said rake surface on a plane defined by said central longitudinal axis of the drill bit and the tangential direction of rotary motion, and a plane perpendicular to said longitudinal axis.

10. The percussion drill bit of any one of the previous claims, wherein one or more of the shear cutters is provided with a pre-cut flat impact surface essentially parallel to the plane perpendicular to the central longitudinal axis.

11. The percussion drill bit of any one of the previous claims, further comprising:

- a plurality of blades protruding from the drill bit;
- a plurality of flow channels stretching along the drill bit in a substantially radial direction whereby the successive flow channels are formed between two adjacent blades;

wherein the shear cutters are provided in rows on the leading edges of the blades with respect to the direction of rotary motion whereby each row of shear cutters has a flow channel associated with it for running a fluid through and thereby removing cutting debris accumulating in front of each row of shear cutters.

12. The percussion drill bit of claim 11, wherein the axial cutters are provided with respect to the direction of rotary motion in a trailing position behind each row of shear cutters and ahead of the subsequent neighbouring flow channel that is associated with the next row of shear cutters of the next blade.

13. The percussion drill bit of any one of the previous claims, wherein the ratio between the number of axial cutters and the number of shearing cutters provided is at least 3:2.

14. Drilling system for drilling a borehole in an earth formation, comprising a drill string provided with a percussion drill bit in accordance with any one of the previous claims, the drilling system further comprising:

- first drive means for rotating the drill bit in the borehole so as to induce a scraping movement of the shear cutters along the borehole bottom; and

- second drive means for inducing repetitive axial percussive impacts on the drill bit in a direction having a component along the axis of the drill bit in the borehole so as to induce at least the axial cutters to exert a percussive force to the borehole bottom.

15. Method of drilling a bore hole into a subterranean earth formation, comprising the steps of providing a drilling system in accordance with claim 14, placing the drill bit against the subterranean earth formation that is to be drilled, exercising a rotary motion about the axis while maintaining a force on the drill bit against the earth formation in the axial direction, and intermittingly providing percussive strikes on the drill bit.